



ARMY INSTITUTE OF PUBLIC HEALTH

# USAPHC

## **Comparison of Injury Rates Between T-10D and T-11 Parachutes**

T-10/T-11 Parachute Injury Project Final Results  
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Dr Joseph J Knapik

Mr Ryan Steelman

US Army Institute of Public Health

Aberdeen Proving Ground, MD

### **Collaborators**

Dr Kevin Klug, Concurrent Technologies Corporation,  
Fayetteville, NC

Mr Keith Colliver, PEO Soldier,  
PM Clothing and Individual Equipment, Ft Belvoir, VA



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## General Background

- Parachuting injuries are 6<sup>th</sup> leading cause of hospitalization in DoD active-duty Soldiers<sup>a</sup>
- The T-10 parachute has served as the main U.S. Army parachute system for personnel since 1952. The maximum design load is 350 lbs.
- Since introduction of the T-10, the average size of America's soldiers and the amount of equipment they are required to carry into battle have both increased
  - In a parachute jump during Operation Just Cause (1989), 4% (24 of 624) carried loads above 350 lbs<sup>b</sup>
  - In parachute operations in Iraqi and Afghanistan (2001-2003), **average** loads were 327 to 380 lbs<sup>c</sup>

## Project Background

- PEO Soldier, PM Clothing and Individual Equipment, oversaw development of the T-11 Advance Tactical Parachute System (ATPS)
- The Defense Safety Oversight Council (DSOC), the Army Institute of Public Health, and PEO Soldier funded this project
- Data collection by Concurrent Technologies Corporation (CTC); statistical analysis by US Army Institute of Public Health (AIPH)

# Purpose

Compare injury rates between the T-10D and T-11 while accounting for known injury risk factors (e.g., wind speed, night jumps, combat loads)



a)



b)

**Underside views of a) T-10D and b) T-11 parachutes**

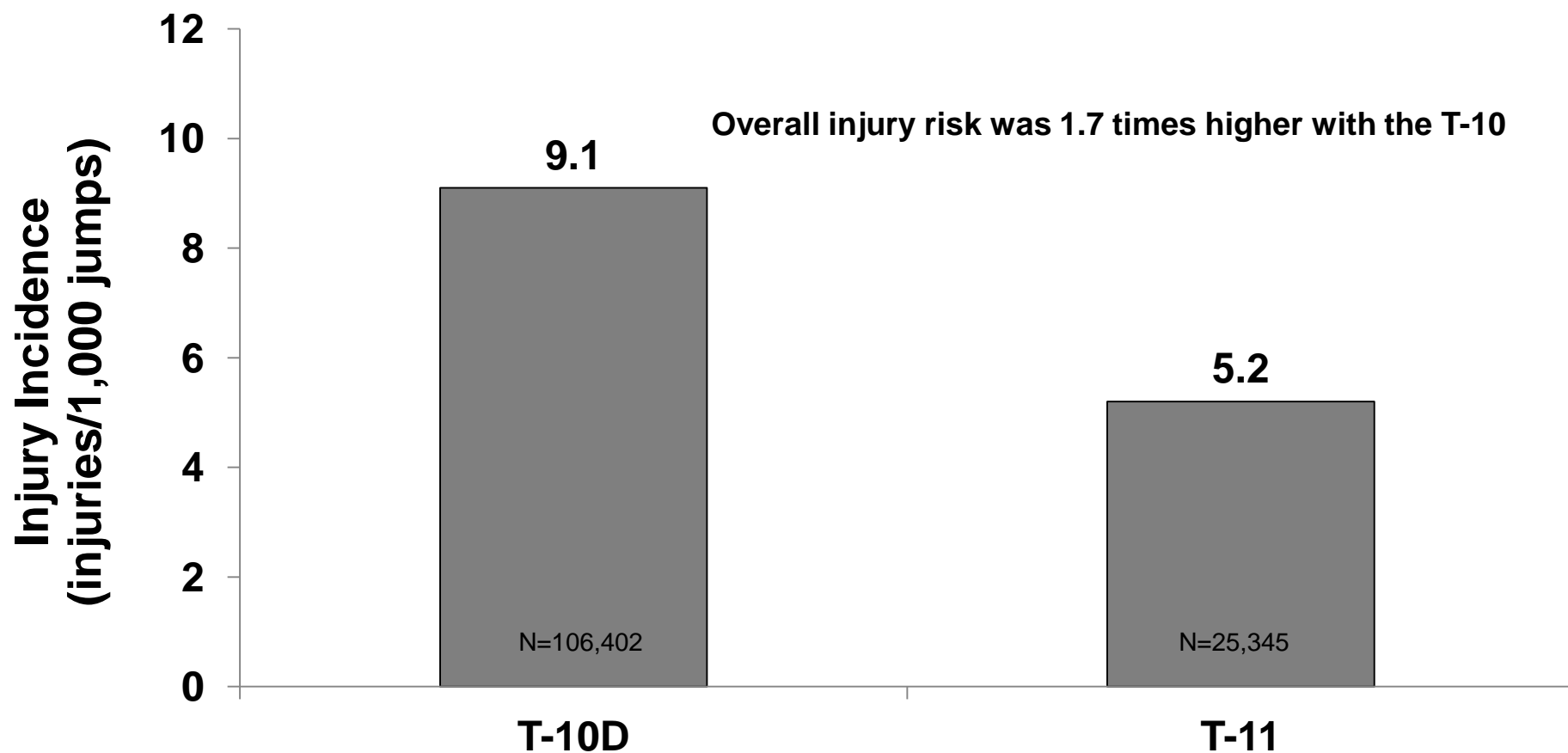
## Data Collection

- Data collected June 2010 to November 2013 (3.5 years) at Ft Bragg NC
- Units:
  - 82d Airborne Division – Jun 2010-Nov 2013
  - XVIII ABC elements & 18<sup>th</sup> ASOG – Jan 2012-Nov2013
- For every jump operation where data were collected, there was an airborne-experienced data collector on drop zone
- Number of jumps
  - T-10D = 106,402
  - T-11 = 25,345

## Data Collected

- Injury data (from medics on drop zone verified with medical records)
  - Type (diagnosis)
  - Anatomical location
  - Evacuation
- Operational Data (flash reports/flight manifests/weather)
  - Time of day
  - Combat loaded vs. admin/nontactical
  - Drop zone
  - Aircraft
  - Jump order
  - Weather (temperature, humidity, heat index, wind speed)

## Overall Injury Incidence with T-10D and T-11 Parachutes



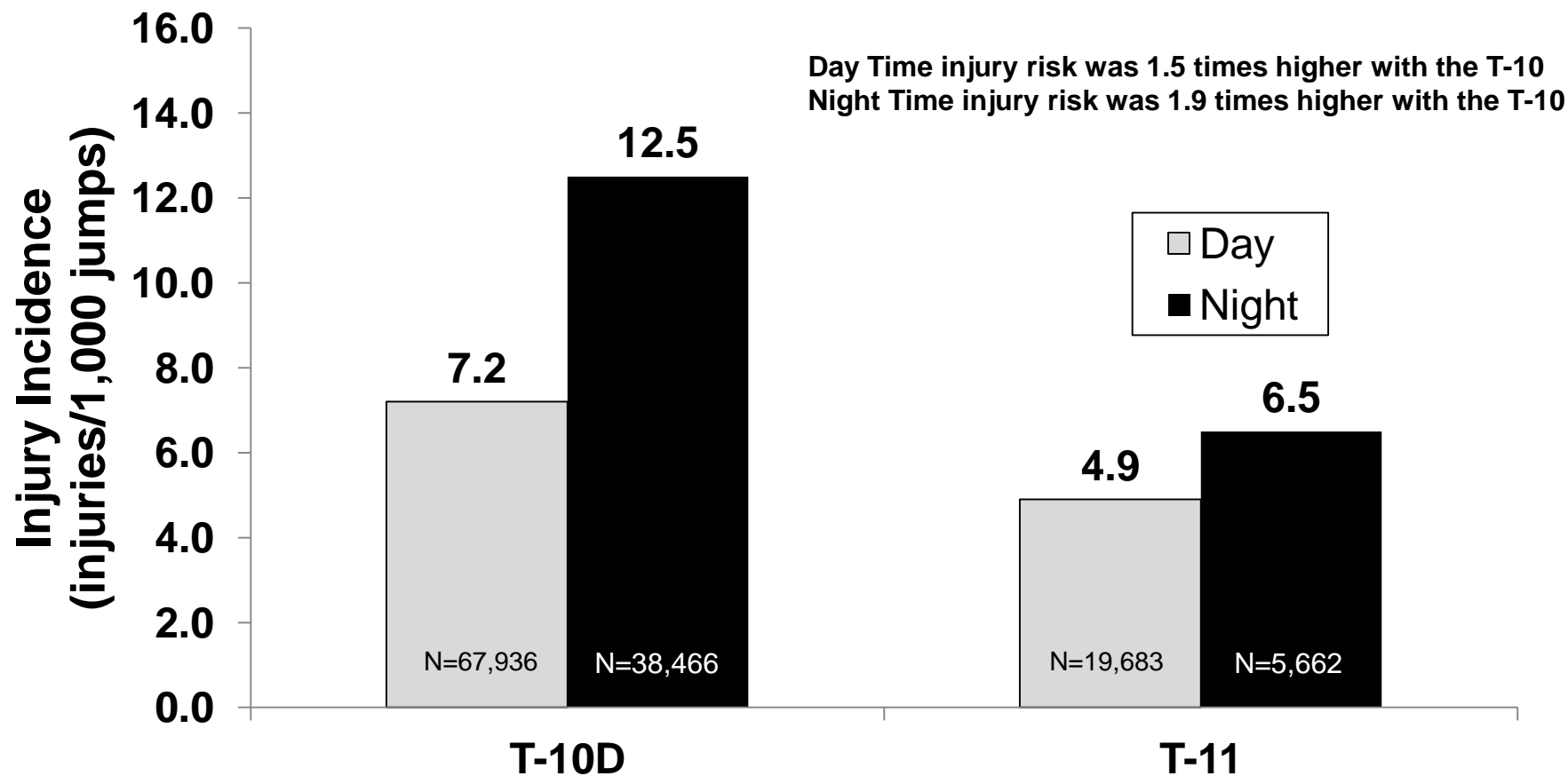
Relative Risk (T10/T11)=1.72, 95%CI=1.45-2.08

## Types of Injuries by Parachute

Type	T-10D		T-11		Risk Ratio- T10/T11 (95%CI)	Chi-square p-value
	N	Injury Incidence (cases/ 1000 jumps)	N	Injury Incidence (cases/ 1000 jumps)		
Head Trauma	338	3.18	38	1.50	2.1 (1.5-3.0)	<0.01
Sprain	134	1.26	21	0.83	1.5 (1.0-2.4)	0.07
Fracture	135	1.27	13	0.51	2.5 (1.4-4.4)	<0.01
Contusion	116	1.09	18	0.71	1.5 (1.0-2.5)	0.09
Strain	84	0.79	24	0.95	0.8 (0.5-1.3)	0.43
Pain (NOS)	94	0.88	10	0.39	2.2 (1.2-4.3)	0.01
Abrasion/Laceration	32	0.30	5	0.20	1.5 (0.6-3.9)	0.38
Dislocation	21	0.20	3	0.12	1.7 (0.5-5.6)	0.40
Muscle/Tendon Rupture	8	0.08	0	0.00	-----	-----
Other Traumatic	4	0.04	0	0.00	-----	-----
Impingement	2	0.02	0	0.00	-----	-----
Fatality	0	0.0	1	0.04	-----	-----

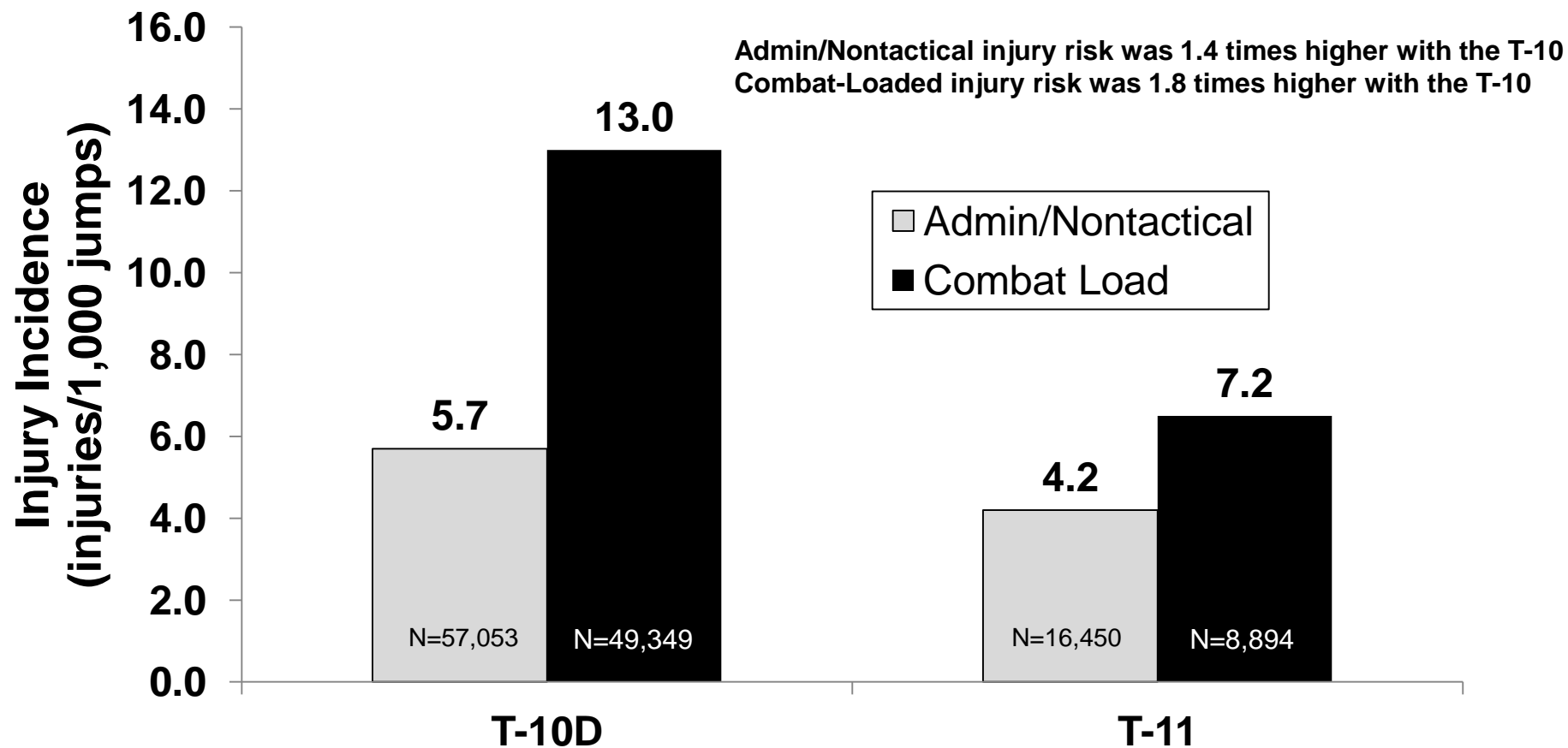


## Day Time and Night Time Injury Incidence with T-10D and T-11



Day Time Relative Risk (T10/T11)=1.48, 95%CI=1.19-1.84  
Night Time Relative Risk (T10/T11)=1.91, 95%CI=1.37-2.66

## Admin/Nontactical and Combat Load Injury Incidence with T-10D and T-11

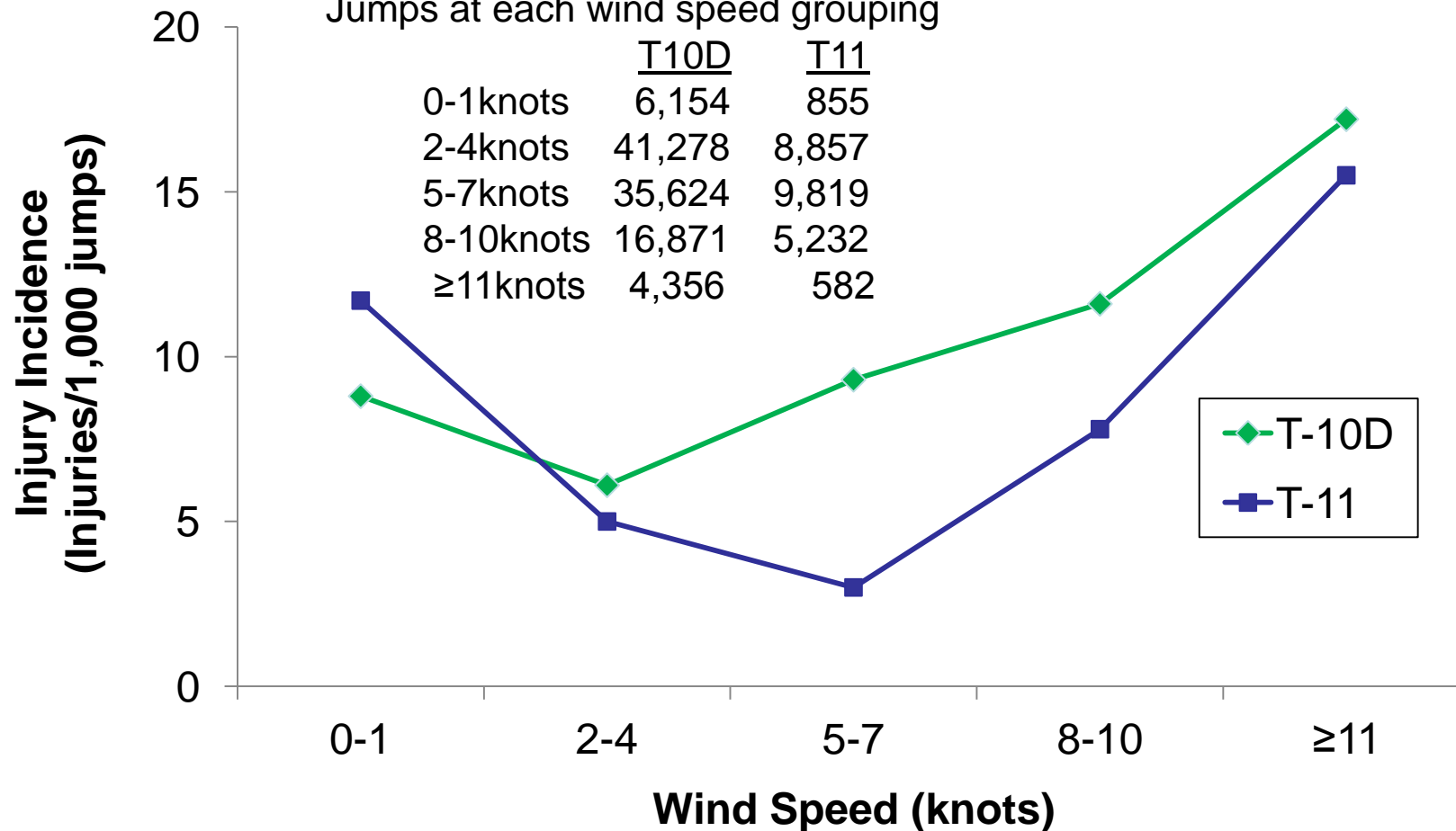


Admin/Nontactical Relative Risk (T10/T11)=1.35, 95%CI=1.05-1.76  
 Combat Loaded Relative Risk (T10/T11)=1.81, 95%CI=1.40-2.34

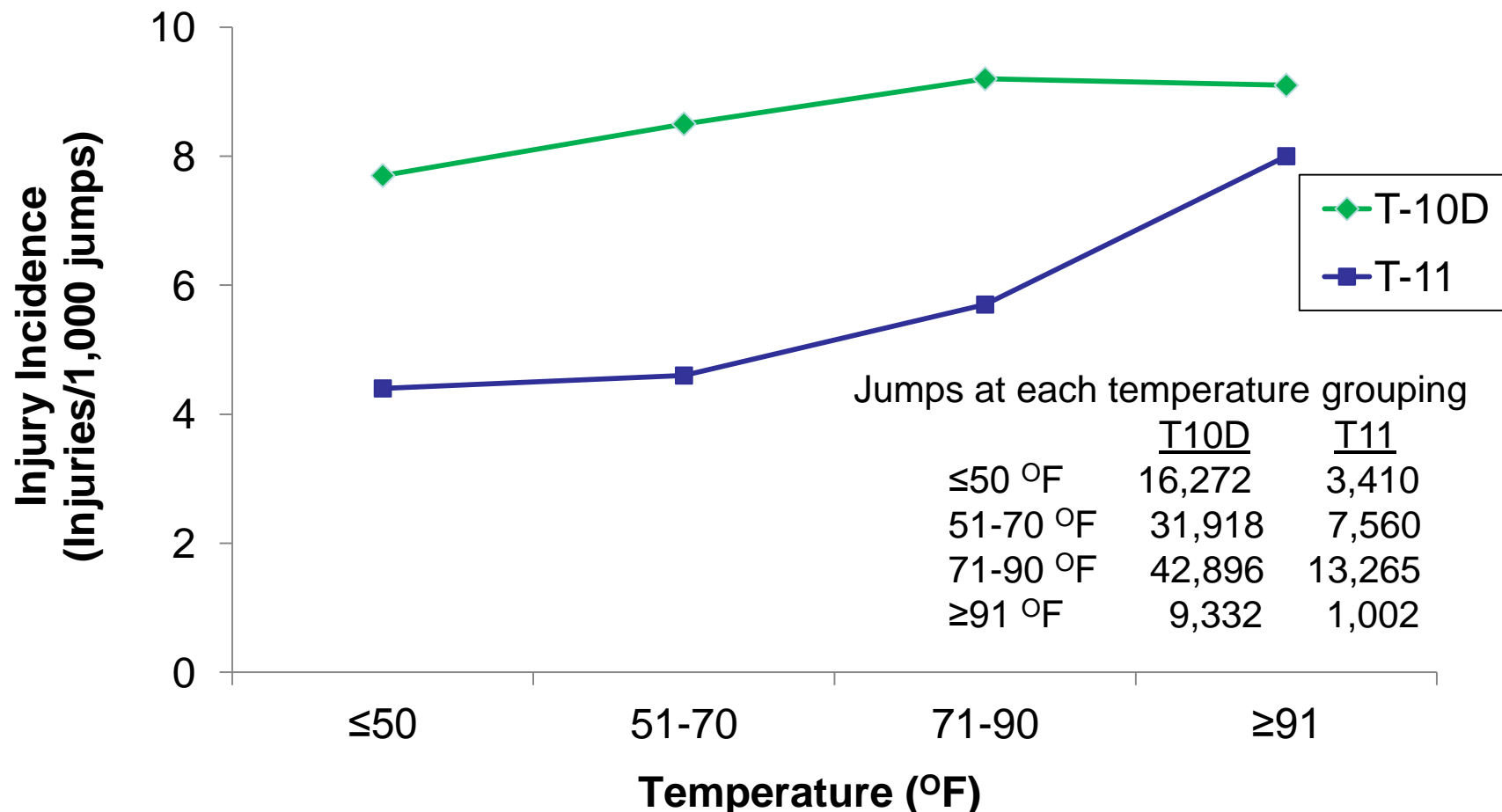
## Wind Speed and Injury Incidence with T-10D and T-11

Jumps at each wind speed grouping

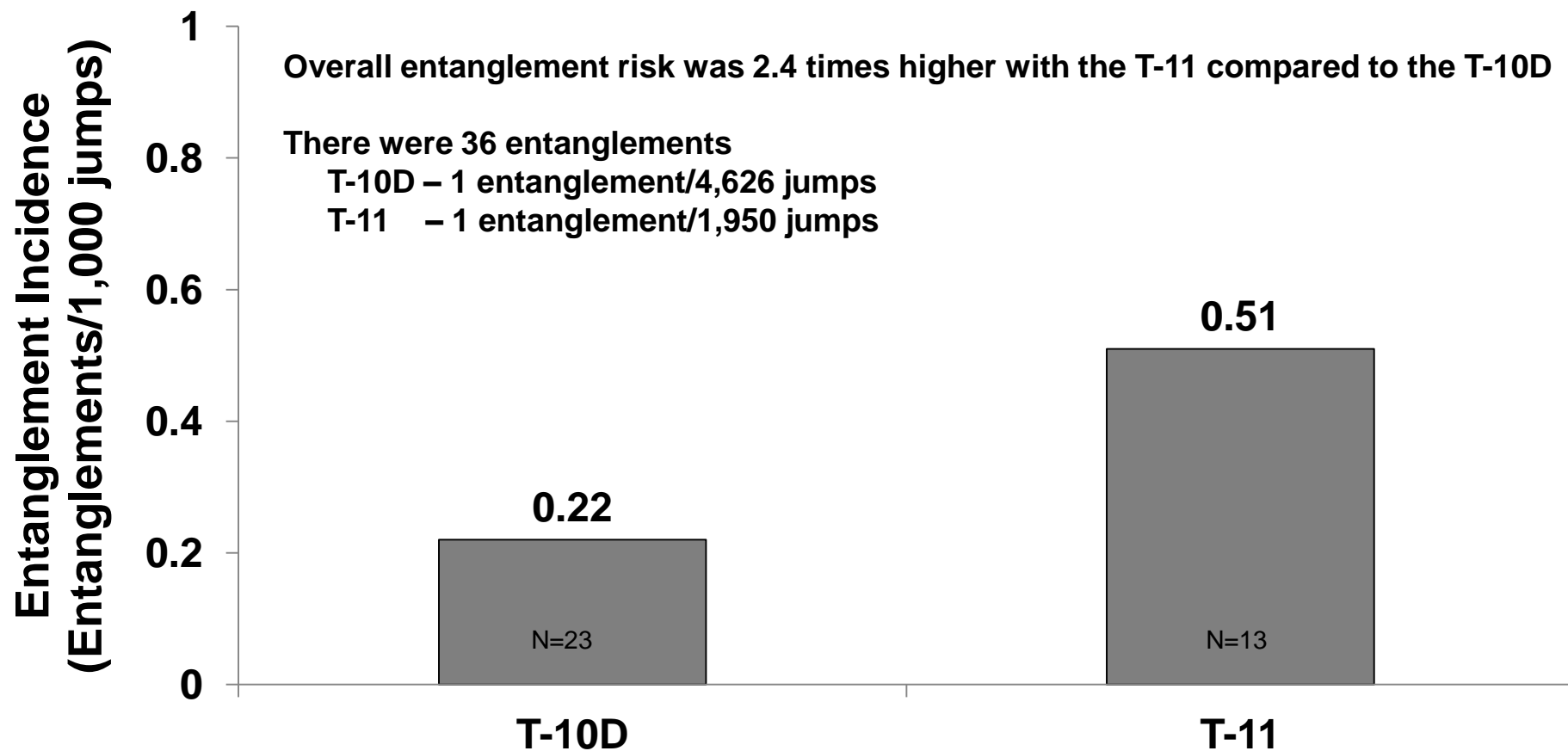
	<u>T10D</u>	<u>T11</u>
0-1knots	6,154	855
2-4knots	41,278	8,857
5-7knots	35,624	9,819
8-10knots	16,871	5,232
≥11knots	4,356	582



# Temperature and Injury Incidence with T-10D and T-11



## Entanglements with T-10D and T-11 Parachutes

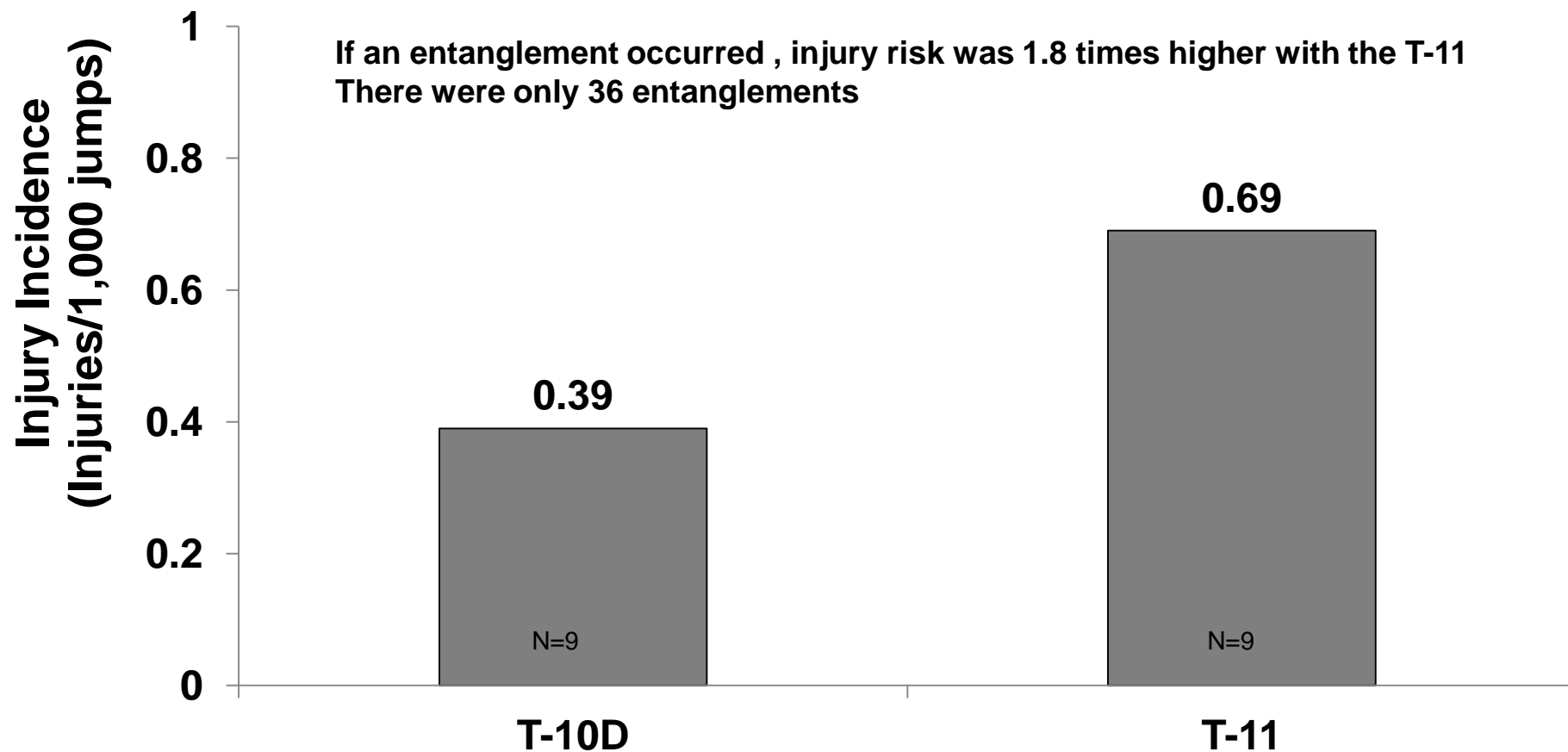


Relative Risk (T11/T10)=2.37, 95%CI=1.20-4.69

## Events Associated with Entanglements by Parachute

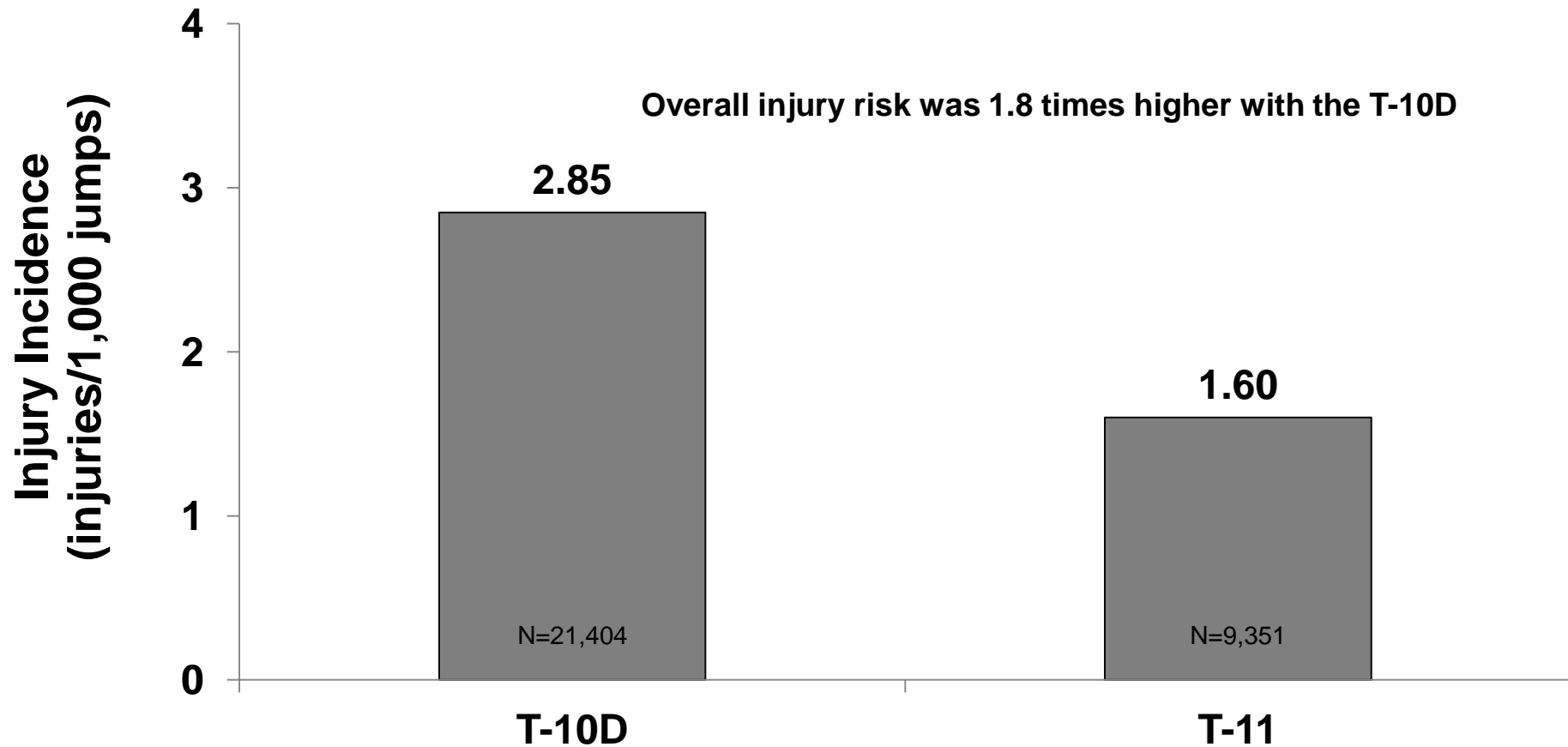
Causes	T-10D		T-11	
	Injured (n)	Not Injured (n)	Injured (n)	Not Injured (n)
Exit Problems	3	7	0	0
Entanglement in Descent	1	7	1	2
Corner Vent	0	0	7	2
Unknown	5	0	1	0
Total	9	14	9	4

## Injury Risk in Entanglements with T-10D and T-11 Parachutes



Relative Risk (T11/T10)=1.77, 95%CI=0.95-3.31

## T-10D vs. T-11 Injury Incidence at Ft Benning Airborne School (Daytime Jumps Only)



Relative Risk (T10/T11)=1.78, 95%CI=1.01-3.12



## Conclusions

- Injury risk was lower for the T-11 compared to the T-10D under almost all operational conditions
- Risk of all types of injuries were lower for the T-11 especially for more serious injuries like head trauma, fractures and sprains
- One exception to favorable results was the rare case of entanglements
  - Few of these (36 in 131,747 jumps or 1 in 3,660 jumps)
  - Risk of entanglement higher for T-11
  - If entanglement occurred, risk of injury higher with T-11
  - Corner vent entanglement most common type with T-11
- Overall injury risk reduction with the T-11 at Ft Bragg similar to that found at the Airborne School